TX Check for GSM/DECT Phones

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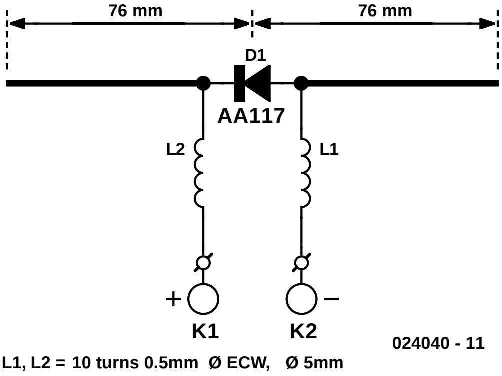
A fieldstrength meter is all you need for a quick go/non-go check on the transmitter section (TX) in a GSM phone (900 MHz or 1800 MHz), a DECT phone (1900 MHz), or a base station.

The antenna used here is a half-wave dipole designed for a wavelength of 32 cm (900 MHz band) or 16 cm (1800 MHz band). Theoretically, the dipole 'arms' have a length of 80 mm (900 MHz) or 40 mm (1800 MHz). However, because the conductors (1) have a finite thickness, (2) are not suspended in free space but etched on a printed circuit board and (3) are close to other objects, the actual length is not given by theory. Observing all of the above factors, a 'velocity factor' of about 0.85 was found by trial and error. Fortunately, a dipole is wideband in nature, and all we need is a relative indication of the transmitter fieldstrength. In practice, good results were obtained from a dipole with a track length of 150 mm (75 mm). A half-wave dipole has its feeder point in the middle, so that element lengths of 75 mm (38 mm) are used.



At resonance, a half-wave dipole is marked by minimum voltage between the feeder points and maximum current at the end of the elements. The current distribution along the dipole is exactly the opposite. In principle, all we need to do is insert a rectifier diode between the feeder points and shunt it with a sensitive micro-ammeter. Because of their low threshold voltage of about 0.2 V, germanium (and some Schottky) diodes are preferred over their silicon counterparts. Suitable diodes include the AA119 and AA117.

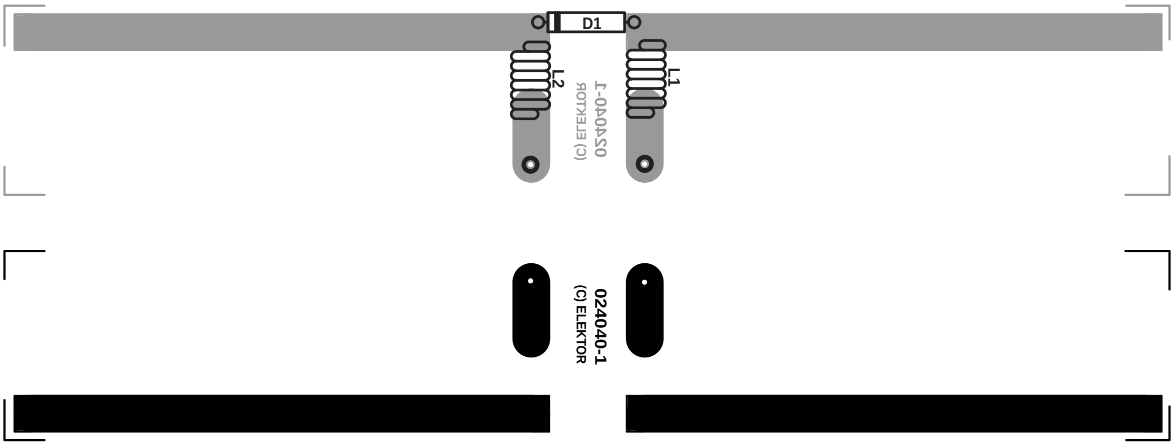
The dipole should have the same polarisation (usually vertical) as the phone you are checking. The RF signal is decoupled from the measured antenna current by two chokes inserted in the lines to the micro-ammeter. Both chokes consist of about 10 turns of enamelled copper wire. Their internal diameter is about 5 mm. The ammeter may be connected at some distance

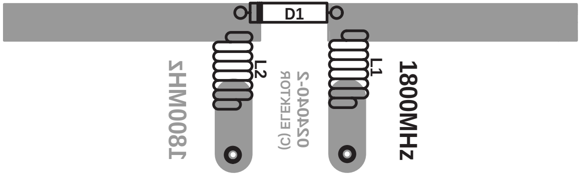
COMPONENTS LIST

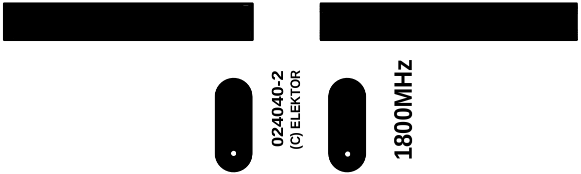
Capacitors:
C1,C2 = 1nF ceramic

Semiconductors:
D1 = AA117, AA119

Inductors:
L1,L2 = choke, 10 turns, 0.5mm ECW, internal diameter 5mm







from the antenna and connected to the chokes by a (long) length of twisted wire. To prevent erroneous readings owing to the connecting cable picking up RF signals, 1-nF decoupling capacitors are connected between across the wires at both ends of the cable. In principle, the fieldstrength meter should also be capable of locating active DECT handsets and base stations operating at frequencies between 1880 and 1930 MHz.

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